SIEMENS

PATENT
Attorney Docket No. 2003P15434WOUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor:	W. Fick et al.	)	
		)	Group Art Unit: 2129
Serial No.:	10/577,315	)	
		)	Examiner: Bharadwaj, Kalpana
Filed:	04/28/2006	)	Confirmation No. 5156

Title: METHOD FOR THE OPERATION OF A TECHNICAL SYSTEM

Mail Stop Appeal Brief - Patent
COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPELLANT'S BRIEF UNDER 37 CFR 41.37

This brief is in furtherance of the Notice of Appeal filed in this application on November 12, 2008.

1. REAL PARTY IN INTEREST - 37 CFR 41.37(c)(1)(i)

The real party in interest in this Appeal is the assignee of the present application, Siemens Aktiengesellschaft.

2. RELATED APPEALS AND INTERFERENCES - 37 CFR 41.37(c)(1)(ii)

To the best of our knowledge, there is no other appeal, interference or judicial proceeding that is related to or that will directly affect, or that will be directly affected by, or that will have a bearing on the Board's decision in this Appeal.

3. STATUS OF CLAIMS - 37 CFR 41.37(c)(1)(iii)

Claims pending: 5-12.

Claims cancelled: 1-4.

Claims withdrawn but not cancelled: none

Claims allowed: none

Claims rejected: 5-12.

Claims on appeal: 5-12.

4. STATUS OF AMENDMENTS - 37 CFR 41.37(c)(1)(iv)

A response (request for reconsideration with no claim amendment) filed under 37 C.F.R. 1.116 on 08/15/2008 was not entered but was considered by the Examiner and was deemed not to place the application into condition for allowance.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER- 37 CFR 41.37(c)(1)(v)

Independent claim 5 is directed to a method for the operation of a technical system. See page 2, lines 1-3 of paragraph 10 of the disclosure of the present invention. Claim 5 recites recording a plurality of operating parameters 5 (FIG. 1) of a system during a time interval. Claim 5 further recites determining an operating mode or functional mode of the technical system from the temporal behavior of the operating parameters using artificial intelligence methods selected from the group consisting of: neuronal network, fuzzy logic, combined neuro/fuzzy method, and genetic algorithm. See page 2, lines 1-7 of paragraph 11 of the disclosure. The determining of the operating or functional mode of the technical system from the temporal behavior of the operating parameters is performed with no model of the technical system. See pages 3-4, lines 1-6 of paragraph 13 of the disclosure. See also page 3, lines 1-4 of paragraph 18 of the disclosure.

Independent claim 10 is directed to a method of controlling the operation of a power station. See page 1, lines 1-2 of paragraph 2 of the disclosure of the present invention. Claim 10 recites recording operating parameters 5 (FIG. 1) of at least part of a system during a time interval. Claim 10 further recites determining an operating mode or functional mode of the technical system from the temporal behavior of the operating parameters using artificial intelligence methods selected from the group consisting of: neuronal network, fuzzy logic, combined neuro/fuzzy method, and genetic algorithm. See page 2, lines 1-7 of paragraph 11 of the disclosure. The determining of the operating or functional mode of the technical system from the temporal behavior the operating parameters is performed with no model of the technical system. See pages 3-4, lines 1-6 of paragraph 13 of the disclosure. See also page 3, lines 1-4 of paragraph 18 of the disclosure. A fingerprint is assigned to the operating parameter by the artificial intelligence method. The fingerprint is compared to a predetermined fingerprint. The operating parameters of the power station are adjusted to achieve a desired operation of the power station. See page 4, lines 1-5 of paragraph 20 and lines 1-10 of paragraph 21 the disclosure.

6. GROUNDS OF REJECTION TO BE REVIEWED UPON APPEAL - 37 CFR 41.37(c)(1)(vi)

A) Whether claims 5-9 stand rejected under 35 U.S.C. 102(b) as being anticipated by US patent application publication No. 2004/0162638 (hereinafter Solomon).

B) Whether claims 10-12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of US patent application publication No. 2002/0136260 (hereinafter Ma).

7. ARGUMENT 37 CFR 41.37(c)(1)(vii)

A. *Regarding the rejection of claims 5-9 under 35 U.S.C. 102(b) as being unpatentable over Solomon.*

Appellant argues that Solomon does not support a *prima facie* case of anticipation for claims 5-9 because Solomon fails to teach each of the structural and/or operational relationships of the claimed invention.

MPEP §2131 provides that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim. The elements must be arranged as required by the claim.

Solomon is directed to self-organizing mobile robotic agents (MRAs in a multi-robotic system (MRS). The MRS of Solomon is a model-based system. Solomon's disclosure is replete with references to this basic requirement of Solomon and a few examples that should suffice are listed below.

Paragraph 28 of Solomon: By decentralizing numerous functions in *a distributed architecture model*, groups of autonomous robotic agents can learn together . . .

Paragraph 37 of Solomon: The "Harness" dynamic *reconfigurable metacomputing model* is a pioneer for this mobile self-organizing MRS hybrid approach . . .

Paragraph 40 of Solomon: Such *a hybrid model* allows for adaptation . . .

Paragraph 41 of Solomon: Why, then, cannot an MRS be developed that emulates, and even transcends, the performance of the animal (and insect) *group model*?

Paragraph 42 of Solomon: First, the application of *Grid computing models* provides an appropriate distributed model for maximizing computation capacity by sharing resources among MRAs in real-time. *This model* can be scalable so that new MRAs can be added . . .

Paragraph 45 of Solomon: Towards a *Hybrid MRS AI Model* . . .

Paragraph 49 of Solomon: Two main *problem solving models* involve . . .

Accordingly, Solomon fails to describe or suggest that the determining of the operating or functional mode of the technical system is performed with no model of the technical system, as set forth in claim 5.

The Examiner acknowledges that the technical system may be a power station. That is, a real-world, physical structure such as one that could be made of bricks and mortar. Then, somehow the Examiner suggests that such a power station is inherently a model. One of ordinary skill in the art would appreciate that a model refers to a representation of a system that allows for investigation of the properties of the system and, in some cases, prediction of future outcomes. One of ordinary skill in the art would appreciate that applicant is not claiming a representation of a technical system but the technical system itself.

The Examiner errs in reasoning that the claimed use of a neural network inevitably means that a model of the technical system is present. The Board is kindly referred to US patent No. 6,038,556 (Adaptive Autonomous Agent With Verbal Learning). This US patent reference (and a non-patent reference titled "A Wall Following Robot With A Fuzzy Logic Controller Optimized By A Genetic Algorithm" by Braunstingl, R., Mujika, J., and Uribe, J.P. (Evidence Appendix A) were appropriately and timely submitted as documents helpful to understand the general state of the art. [1]

In particular, the foregoing patent reference describes at col. 4, lines 43-49 (Evidence Appendix B) that "[one skilled in the art] has proved that certain kinds of problems cannot be

---

[1] Applicant notes that these references were submitted on 08/15/2008 via a Supplementary Information Disclosure Statement. More particularly, such supplementary Information Disclosure Statement complies with the requirements set forth in 37 C.F.R. 1.97 and it further complies with M.P.E.P. requirements, as set forth in §609.04(b) III and therefore such references are part of the prosecution record of this application.

solved without the use of models or representations of the world. Most neural network architectures have no model component and therefore cannot solve such problems. Those that do, (citation omitted) require that the model be specified to a significant (and often impossible) degree by the system developer." That is, one skilled in the art would appreciate that the fact that one uses artificial intelligence tools (e.g., a neural network) does not axiomatically mean that a model (i.e., a representation) of the technical system or power station is required. Similarly, the cited non-patent reference corroborates that use of artificial intelligence tools (e.g., fuzzy logic, genetic algorithm) does not necessarily require a model of the environment (the walls in the cited example). Thus, the Examiner errs in her understanding of the prior art regarding the claimed invention in view of the understanding manifested by those skilled in the art, which directly refutes the reasoning articulated by the Examiner for maintaining the §102 rejection.

Once again applicant reiterates that one skilled in the art will appreciate that the multi-robotic system of Solomon is a model-based system. Accordingly, one skilled in the art will appreciate that Solomon fails to describe or suggest that the determining of the operating or functional mode of the technical system is performed with no model of the technical system, as set forth in claim 5. The determination of the operating mode or functional mode of the technical system of the claimed invention is learned from the temporal behavior of the operating parameters using any of various artificial intelligence techniques but is clearly not learned from a model of the technical system. Anticipation under 35 U.S.C. §102 requires that "there must be no difference between the claimed invention and the referenced disclosure, as viewed by a person of ordinary skill in the field of the invention." Scripps Clinic and Research Found. v. Genentech Inc., 927 F.2d 1565, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991)). Absence from the reference disclosure of any claim element and/or operational interrelationship negates anticipation under §102. Accordingly, it is submitted that Solomon fails to anticipate or otherwise render unpatentable claim 5 (and claims depending there from) and this basis of rejection should be withdrawn.

B. *Regarding the rejection of claims 10-12 under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of Ma.*

Appellant argues that the *Solomon/Ma* combination does not constitute an appropriate *prima facie* combination for renderings claims 10-12 unpatentable.

M.P.E.P. 2143.04 provides that to establish *prima facie* obviousness of a claimed invention, all the claims limitations must be taught or suggested by the prior art. All words in a claim must be considered for judging the patentability of the claim against the prior art. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending there from is nonobvious.

It is respectfully noted that Ma fails to remedy the deficiencies of Solomon noted above in connection with the claimed invention. Solomon multi-robotic system is a model-based system. Appellant's invention is not a model-based system. Consequently, independent claim 10, (and claims depending there from) are not rendered obvious by the Solomon/Ma combination, and this basis of rejection should also be withdrawn.

8. CLAIMS APPENDIX - 37 CFR 41.37(c) (1) (viii).

A copy of the claims involved in this appeal is attached as a claims appendix under 37 CFR 41.37(c) (1) (viii).

9. EVIDENCE APPENDIX - 37 CFR 41.37(c) (1) (ix)

A copy of the excerpts of the references cited in this appeal are attached as Evidence Appendix A and Evidence Appendix B under 37 CFR 41.37(c) (1) (ix).

10. RELATED PROCEEDINGS APPENDIX - 37 CFR 41.37(c) (1) (x)

None is required under 37 CFR 41.37(c) (1) (x).

Respectfully submitted,

Dated: Nov. 20, 2008

By: Janet D. Hood

Janet D. Hood
Registration No. 61,142
(407) 736-4234

Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, New Jersey 08830

APPENDIX OF CLAIMS ON APPEAL

5. A method for the operation of a technical system, comprising:

recording a plurality of operating parameters of a system during a time interval; and

determining an operating or functional mode of the technical system from the temporal behavior the operating parameters using artificial intelligence methods selected from the group consisting of: neuronal network, fuzzy logic, combined neuro/fuzzy method, and genetic algorithm, wherein the determining of the operating or functional mode of the technical system from the temporal behavior the operating parameters is performed with no model of the technical system.

6. The method according to claim 5, wherein an operating and a functional mode of the technical system are determined from the temporal behavior the operating parameters using artificial intelligence methods selected from the group consisting of: neuronal network, fuzzy logic, combined neuro/fuzzy method, and genetic algorithm.

7. The method according to claim 5, wherein the operating parameters are recorded as data sets during a plurality of temporally separate time intervals and the data sets are compared using the artificial intelligence methods, and an adjustment of the operating parameters is determined in order to achieve a desired operating mode of the technical system.

8. The method according to claim 7, wherein a probability that an adjustment of the operating parameters provides for the desired operating mode is determined.

9. The method according to claim 8, wherein the operating mode of the technical system is determined using a correlation analysis of the operating parameters, wherein the result of changes in operating parameters that correspond to input parameters is determined based on operating parameters which correspond to output parameters.

10. A method of controlling the operation of a power station, comprising:

recording operating parameters of at least part of a system during a time interval;

determining an operating mode or functional mode of the technical system from the temporal behavior the operating parameters using artificial intelligence methods selected from the group consisting of: neuronal network, fuzzy logic, combined neuro/fuzzy method, and genetic algorithm, wherein the determining of the operating or functional mode of the technical system from the temporal behavior the operating parameters is performed with no model of the technical system;

assigning a fingerprint to the operating parameter by the artificial intelligence method;

comparing the fingerprint to a predetermined fingerprint; and

adjusting the operating parameters of the power station in order to achieve a desired operation of the power station.

11. The method according to claim 10, wherein a probability that an adjustment of the operating parameters provides for the desired operating mode is determined.

12. The method according to claim 11, wherein the operating mode of the power station is determined using a correlation analysis of the operating parameters, wherein the result of changes in operating parameters that correspond to input parameters is determined based on operating parameters which correspond to output parameters.

EVIDENCE APPENDIX A

A wall following robot with a fuzzy logic controller optimized by a genetic algorithm

Braunstingl, R. Mujika, J. Uribe, J.P.
IKERLAN Centro de Investigaciones Technol., Guipuzcoa;

This paper appears in: **Fuzzy Systems, 1995. International Joint Conference of the Fourth IEEE International Conference on Fuzzy Systems and The Second International Fuzzy Engineering Symposium., Proceedings of 1995 IEEE International Conference on**
Publication Date: 20-24 Mar 1995
Volume: 5, On page(s): 77-82 vol.5
Meeting Date: 03/20/1995 - 03/24/1995
Location: Yokohama, Japan
ISBN: 0-7803-2461-7
References Cited: 5
INSPEC Accession Number: 5032663
Digital Object Identifier: 10.1109/FUZZY.1995.410047
Date Published in Issue: 2002-08-06 19:45:43.0

Abstract
A wall following mobile robot equipped with ultrasonic sensors is presented. This robot uses a fuzzy logic controller and local navigation strategy. The basis for reactive navigation is provided by the concept of general perception which passes perceptual information of the sensors on to the fuzzy system without modeling walls or obstacles. Thus, no representation of the environment is needed. The rule base of the fuzzy system was designed by hand and then a genetic algorithm applied to find optimum membership functions so that the robot moves at constant distance to the wall, at high speed and as smoothly as possible. Optimization was done using a simulated robot. The results of this simulation proved satisfactorily close to reality when tested in a real robot

EVIDENCE APPENDIX B

Hutchison, W. R. & Stephens, K. R., Integration of distributed and symbolic knowledge representations, Proceedings of the first international conference on neural networks, 2, 395-398, IEEE Press. This can be accomplished by connecting the condition part of the rule (as inputs) to the action part of the rule (as outputs). Most ANN architectures and algorithms are not compatible with such an approach.

The most common technique for training ANNs to follow rules has been to construct training sets whose mastery requires following the rules. The ANN may be allowed to make errors or it may be artificially forced to make the correct response (Lin, 1991; Whitehead, 1991). As with direct programming, the resulting system complies, but does not explicitly follow, the rules. There are a number of major disadvantages to training compliance by examples:

a. Constructing the set of training examples is usually a significant additional effort beyond formulating the rule; it must be done for every rule.

b. It may be difficult or impossible to create a training set that contains the desired relationships while avoiding irrelevant relations.

c. It is especially difficult-even impossible in some networks-to train correct behavior where certain actions are almost always rewarded (e.g., crossing railroad tracks, investing in real estate in previously solid markets), but on rare occasions have catastrophic results.

d. Many relations are so remote in time or space, or so weak in probability that they will never be learned by direct experience of an individual (e.g., avoiding chemicals that cause cancer years later). If they are taught by overrepresenting them in the sample, the learning will be inappropriate for optimization.

In both direct programming and training set techniques, the system complies with the given rules, but does not learn the rule as a verbal statement. Lack of explicit verbal content imposes a number of major disadvantages on such systems.

A "rule-compliant" network cannot adequately state what it knows. In certain types of networks the structure can be decoded, but a listing of the associations generally contains a large number of irrelevant relations. Another approach (Gallant, 1988, 1993) is to determine partial derivatives by testing the impact of manipulating an input on an output, but this is not practical for complex relations which are typical of real world problems. Systems that cannot state their knowledge cannot:

i. Explain or justify their actions.

ii. Teach another person or system.

iii. Learn from discussing their knowledge with other agents (human or machine).

This weakness is very serious in any case, but especially in view of the rapidly developing communications network in which computers are connected, where the ability to converse verbally with other agents opens up a vast potential not otherwise available.

An important process in human problem solving uses verbal behavior to transform a novel problem into a new problem or subproblems for which solutions are known (Donahoe & Palmer, 1994). For example, if the answer to the problem "23 times 117" is not immediately known, we "break down" the problem into subproblems for which we have answers (e.g., 3 times 7). Networks without explicit verbal behavior cannot do such problem solving. Even more demanding is "creative problem solving" where we may have to perform several tentative "verbal transformations" before even recognizing how to proceed.

Current neural network methods are handicapped by their lack of verbal behavior, because the network is required to learn a complex task all at once rather than decomposing it. For example, Minsky and Papert (1969) asserted that linear nets cannot learn the exclusive OR problem. On the contrary, the Applicant has trained a linear network to perform this task perfectly, using verbal behavior in the same manner as many humans actually solve it. First the agent learns the "OR" problem more typical in the real world: when presented with the two input stimuli, the agent responds to any positive stimulus with a positive output on the main output. Then the agent is taught an additional verbal response: If both stimuli are positive, the agent emits, in addition to the positive main response, a response which functions like saying "both". After saying "both", in the next network cycle that verbal response is available as an additional input to itself, which suppresses the system's positive response and strengthens a negative response. In general terms, the verbal capability of the system enables it to reduce the effective dimensionality of the problem. Networks that can be taught these verbal responses can learn to solve many problems much faster.

As described above, networks can be taught or programmed to comply with rules, which is only one simple kind of input-output. However, such methods do not work for any other of the myriad kinds of relations in the world, such as: above, in, of, sister of, inside, subclass of, threatens, suggests, is the capital of, etc. ANN language research and knowledge-based systems that accommodate such relations have to explicitly program their processing: they cannot learn new relations from experience as can humans. This is a huge weakness.

Beyond being able to learn many kinds of relations is the challenge of deriving some value from the knowledge. Except for the trivial case of being able to repeat a relational statement, learning it will not be useful unless the agent has also learned how to combine the statement with other relational statements, and ultimately to actions. An agent must explicitly learn how to combine X>Y and Y=Z to conclude that X>Z; and that X>Y and Y<Z does not lead to any conclusion about the relation of X and Y. This essential learning has also not been done with neural networks.

Jameson (1993) has proved that certain kinds of problems can not be solved without the use of models or representations of the world. Most neural network architectures have no model component and therefore cannot solve such problems. Those that do (e.g., White & Sofge, 1992) require that the model be specified to a significant (and often impossible) degree by the system developer. Verbal behavior permits a system to construct such models.

Obviously, some sources of information are more reliable than others, such that information should be differentially learned, and thereafter differentially relied upon. ANNs are programmed or trained to comply with all advice, or if differential strengths are used, they must be given by the developer rather than learned. If a new statement were then given from a known source, the system should be able to generalize regarding the reliability of the statement from the reliability of previous statements from that source; but existing methods would not handle that case. This capability should go beyond considering the source: Take Einstein's advice about physics but not about economics.

Apart from the differential reliability of statements, they have different degrees of value. It may be perfectly reliable that there are 743 cats in Chanute, Kansas, but the value of this knowledge is so low that an agent should not waste resources learning it.

RELATED PROCEEDINGS APPENDIX

None.